(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－174110
（P2002－174110A）
(43)公開日　平成14年６月21日(2002.6.21)

(51)Int.Cl.⁷	識別記号	ＦＩ		テーマコード（参考）
Ｆ０１Ｎ　3/02	３０１	Ｆ０１Ｎ　3/02	３０１Ｋ	３Ｇ００５
Ｆ０２Ｂ　37/00	３０２	Ｆ０２Ｂ　37/00	３０２Ｆ	３Ｇ０６２
Ｆ０２Ｍ　25/07	５７０	Ｆ０２Ｍ　25/07	５７０Ｂ	３Ｇ０９０
			５７０Ｐ	
	５８０		５８０Ａ	

審査請求　未請求　請求項の数１　ＯＬ　（全　４　頁）　最終頁に続く

(21)出願番号　特願2000－369181(P2000－369181)

(22)出願日　平成12年12月４日(2000.12.4)

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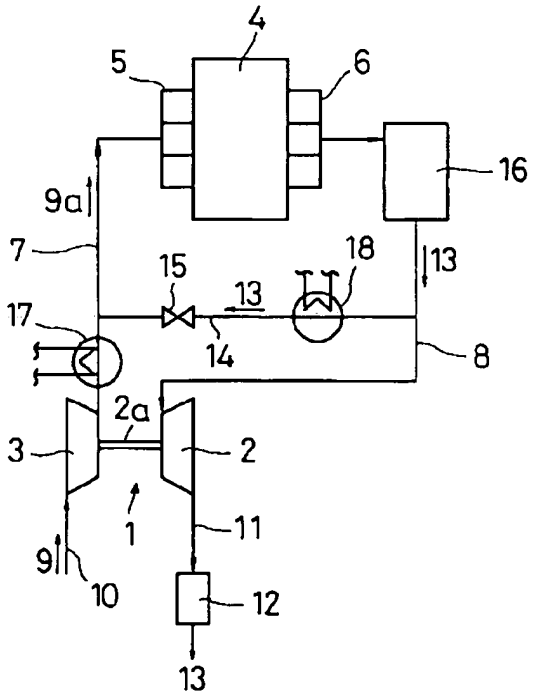
(54)【発明の名称】　ディーゼルエンジン

(57)【要約】
【課題】　ＤＰＦに煤が蓄積してもＥＧＲ率の変化を抑制する。
【解決手段】　タービン２と圧縮機３とからなる過給機１を、ディーゼルエンジン４のインテークマニホールド５とエキゾーストマニホールド６に、それぞれ圧縮機出口通路７とタービン入口通路８を介して接続する。タービン入口通路８と圧縮機出口通路７との間に、ＥＧＲバルブ１５を備えたＥＧＲ通路１４を設ける。タービン入口通路８におけるＥＧＲ通路１４の接続部よりも上流側位置に、ＤＰＦ１６を装備する。ディーゼルエンジン４からの排気ガス１３を、ＤＰＦ１６に送って煤の捕集、除去を行い、該ＤＰＦ１６にて煤の捕集、除去の行われた排気ガス１３を、タービン２に送り過給機１による過給圧を発生させると共に、その一部を、ＥＧＲ通路１４を通して圧縮機出口通路７を通る圧縮空気９ａに混入させて、ディーゼルエンジン４へ循環供給させる。



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【特許請求の範囲】

【請求項１】　圧縮機とタービンとからなる過給機を備え、該過給機の圧縮機で吸気を圧縮して給気すると共に、排気ガスを過給機のタービンに導いて該タービンを駆動させ、且つ排気通路となるタービン入口通路と給気通路となる圧縮機出口通路との間に、ＥＧＲバルブを備えたＥＧＲ通路を接続して排気ガス再循環できるようにしてあるディーゼルエンジンにおいて、上記タービン入口通路におけるＥＧＲ通路の接続部よりも上流側位置にＤＰＦを設置してなる構成を有することを特徴とするディーゼルエンジン。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は排気ガスの流路にディーゼルパティキュレートフィルタ（ＤＰＦ）を設置して、排気ガス中の煤を捕集して大気中への放出を抑制できるようにしてあるディーゼルエンジンにおいて、排気ガス再循環率を変化させないようにするディーゼルエンジンに関するものである。

【０００２】

【従来の技術】一般に、バスやトラック等に用いられる大型のディーゼルエンジンには過給機（ターボチャージャ）が装備されている。この種過給機を装備したディーゼルエンジンは、図２にその一例の概略を示す如く、タービン２と圧縮機３とをタービン軸２ａで連結してなる過給機１を、ディーゼルエンジン４のインテークマニホールド５及び排気マニホールド６に、それぞれ給気通路となる圧縮機出口通路７及び排気ガス通路となるタービン入口通路８を介して接続し、且つ圧縮機３の入口側に、図示しないエアクリーナを備えた圧縮機入口通路１０を接続し、又、タービン２の出口側に、サイレンサ１２を備えたタービン出口通路１１を接続した構成として、ディーゼルエンジン４からの排気ガス１３を、タービン入口通路８を通してタービン２に送り、該排気ガス１３によるタービン２の駆動により圧縮機３を作動させて、圧縮機入口通路１０より空気９を吸入（吸気）して圧縮し、圧縮空気９ａを圧縮機出口通路７を通してディーゼルエンジン４に給気するようにしてある。なお、タービン２で仕事をして排出された排気ガス１３は、タービン出口通路１１を通りサイレンサ１２を経て大気中に放出させるようにしてある。

【０００３】上記ディーゼルエンジンでは、排気ガス中の低ＮＯｘ化対策が重要な課題となっている。そのため、上記タービン入口通路８と圧縮機出口通路７との間に、ＥＧＲ（排気ガス再循環）通路１４を設け、且つ該ＥＧＲ通路１４にＥＧＲバルブ１５を備えた構成として、上記ＥＧＲバルブ１５の開度を、たとえば、１０％の開度とすることにより、タービン入口通路８を通る排気ガス１３の一部を、給気側との圧力差に基いてＥＧＲ通路１４より圧縮機出口通路７に送り、該圧縮機出口通路７を通る圧縮空気９ａに混入させてディーゼルエンジン４に循環供給できるようにし、これにより燃焼混合気中の不活性ガスの割合を増加させて、酸素濃度を低下させると共に燃焼温度を下げて、ＮＯｘの発生を抑えることができるようにしてある。

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【０００４】一方、ディーゼルエンジンの場合、排気ガス中に含まれる粒子状物質は環境基準の対象となっている。そのため、近年では、排気ガス規制の一環として、ディーゼルエンジンより排出される排気ガス中に含まれている煤の大気中への放出を抑制することが望まれるようになってきている。このため、従来では、上記過給機１のタービン２出口側に接続されているタービン出口通路１１の途中に、ディーゼルパティキュレートフィルタ（以下、ＤＰＦと記す）１６を設置し、タービン２から排出された排気ガス１３を大気中へ放出する前にＤＰＦ１６に通して、排気ガス１３中に含まれる煤を捕集することにより、煤が大気中に放出されることを抑制できるようにしてある。

【０００５】なお、１７は圧縮空気９ａを冷却するために必要に応じて設けるインタークーラ、１８は再循環させる排気ガス１３を冷却するために必要に応じて設けられるＥＧＲクーラをそれぞれ示す。

【０００６】

【発明が解決しようとする課題】ところが、ディーゼルエンジン４の運転においては、運転時間の増加に伴ってＤＰＦ１６には煤が蓄積されるようになるが、この際、上記従来のディーゼルエンジンでは、ＤＰＦ１６をタービン２の下流側に設けているため、煤の蓄積によりＤＰＦ１６における圧力損失が変化した場合、タービン２の出口側圧力が変化するため、圧縮機出口通路７に接続したＥＧＲ通路１４の接続部と、タービン入口通路８に接続したＥＧＲ通路１４の接続部における圧力バランスが変化する。このためＥＧＲバルブ１５の開度を、１０％の開度で一定に保持したとしても、給気側と排気側の圧力バランスで決定される排気ガス１３の再循環量、すなわち、ＥＧＲ率が次第に変化するため、燃焼混合気の組成が変化してしまい、ディーゼルエンジン４の運転制御が困難になるという問題があり、又、ＥＧＲ率を一定に保つためには、ＤＰＦ１６の煤の蓄積状況の変化に応じて、その都度ＥＧＲバルブ１５を操作して開度を調整し直さなければならないという問題が生じる。

【０００７】因みに、上記問題を解決する手段として、図３に示す如く、ＤＰＦ１６よりも下流側位置におけるタービン出口側通路１１と、圧縮機入口通路１０との間に、ＥＧＲバルブ１５を備えたＥＧＲ通路１４を設けて、低圧の排気ガス１３の一部をＥＧＲ通路１４により圧縮機入口通路１０に導入して該圧縮機入口通路１０を通る空気９に混入させることにより、ディーゼルエンジン４に循環供給させるようにすることが提案されているが、この場合は、圧縮機３に排気ガス１３が通ることに

なるため、該排気ガス１３中に含まれる腐食性ガスにより圧縮機１３が腐食する虞があって、実際に採用するのは困難であり、又、低圧の排気ガス１３を再循環させるためには、ＥＧＲ通路１４の径を大きくしなければならないという問題もある。

【０００８】そこで、本発明は、ディーゼルエンジンの運転時にＤＰＦに煤が蓄積し、その蓄積状況が変化した場合にもＥＧＲ率をほぼ一定に保つことができて、制御性を向上させることができるディーゼルエンジンを提供しようとするものである。

【０００９】

【課題を解決するための手段】本発明は、上記課題を解決するために、圧縮機とタービンとからなる過給機を備え、該過給機の圧縮機で吸気を圧縮して給気すると共に、排気ガスを過給機のタービンに導いて該タービンを駆動させ、且つ排気通路となるタービン入口通路と給気通路となる圧縮機出口通路との間に、ＥＧＲバルブを備えたＥＧＲ通路を接続して排気ガス再循環できるようにしてあるディーゼルエンジンにおいて、上記タービン入口通路におけるＥＧＲ通路の接続部よりも上流側位置にＤＰＦを設置してなる構成とする。

【００１０】ディーゼルエンジンの通常運転時では、排気ガスはタービン入口通路を通してＤＰＦに導かれ、該ＤＰＦにて煤が捕集、除去される。煤が捕集、除去された排気ガスは、タービンに送られると同時に一部の排気ガスが、ＥＧＲ通路を通し圧縮機出口通路に送られて給気に混入されるので、ディーゼルエンジンにおける燃焼混合気中の不活性ガスの割合が増加し、これにより、ＮＯｘの発生が抑制される。

【００１１】ディーゼルエンジンの運転時間の増加に伴い、ＤＰＦに煤が蓄積すると、該ＤＰＦにおける圧力損失は変化するが、この際、ＤＰＦの出口側においては圧力損失の影響が小さくなるため、ＥＧＲ通路の接続位置における給気側と排気側の圧力バランスの変化は抑制され、ＥＧＲバルブの開度調整を行うことなくＥＧＲ率はほぼ一定に保たれる。

【００１２】

【発明の実施の形態】以下、本発明の実施の形態を図面を参照して説明する。

【００１３】図１は本発明のディーゼルエンジンの実施の一形態を示すもので、図２に示したものと同様に、タービン２と圧縮機３とをタービン軸２ａで連結してタービン２により圧縮機３を駆動するようにしてある過給機１を、ディーゼルエンジン４のインテークマニホールド５とエキゾーストマニホールド６に、それぞれ給気通路としての圧縮機出口通路７と排気ガス通路としてのタービン入口通路８を介して接続し、且つ上記タービン入口通路８と圧縮機出口通路７との間に、ＥＧＲバルブ１５を備えたＥＧＲ通路１４を接続した構成において、上記タービン入口通路８におけるＥＧＲ通路１４の接続部よりも上流側位置に、ＤＰＦ１６を設置してなる構成とする。その他、図２に示したものと同一のものには同一符号が付してある。

【００１４】ＥＧＲバルブ１５の開度を、たとえば、１０％の開度と設定して運転すると、ディーゼルエンジン４からの排気ガス１３は、タービン入口通路８を通してＤＰＦ１６に送られて煤の捕集が行われる。その後、上記ＤＰＦ１６にて煤が捕集されて除去された排気ガス１３は、タービン２に送られ、一方、排気ガス１３の一部は、排気側と給気側との圧力差に基いてＥＧＲ通路１４を通して圧縮機出口通路７に送られ、給気としての圧縮空気９ａに混入されてディーゼルエンジン４に循環供給される。この排気ガス１３の再循環により燃焼混合気中の不活性ガスの割合を増加させることができて、ＮＯｘの発生が抑制されるようになる。上記タービン２へ送られた排気ガス１３は、タービン２で仕事をした後、タービン出口通路１１を通りサイレンサ１２を経て大気中に放出される。

【００１５】ディーゼルエンジン４の運転時間の増加に伴い、ＤＰＦ１６に煤が蓄積すると、該ＤＰＦ１６における圧力損失は変化するが、この際、ＤＰＦ１６の出口側においては、上記圧力損失の影響は小さいものとなる。このため、ＤＰＦ１６よりも下流側となるＥＧＲ通路１４の接続部におけるタービン入口通路８内の排気ガス１３の圧力変化を抑制することができて、給気側と排気側の圧力バランスの変化を抑えることができることになる。これにより、ＤＰＦ１６への煤の蓄積状況が変化してもＥＧＲバルブ１５の開度調整を行うことなくＥＧＲ率をほぼ一定に保つことができ、ディーゼルエンジンの運転時に要する作業量を減らして制御性を向上させることができる。

【００１６】又、ＤＰＦ１６には圧力の高い排気ガス１３を通すことができるので、該ＤＰＦの小型化を図ることが可能となり、更に、温度低下の少ない排気ガス１３をＤＰＦ１６に通すようにしてあることから、ＤＰＦ１６自体が高温となるため、蓄積した煤を高温燃焼させて除去するＤＰＦ１６の再生作業を容易なものとすることができる。

【００１７】なお、本発明は上記実施の形態のみに限定されるものではなく、本発明の要旨を逸脱しない範囲内において種々変更を加え得ることは勿論である。

【００１８】

【発明の効果】以上述べた如く、本発明のＤＰＦ付ディーゼルエンジンによれば、圧縮機とタービンとからなる過給機を備え、該過給機の圧縮機で吸気を圧縮して給気すると共に、排気ガスを過給機のタービンに導いて該タービンを駆動させ、且つ排気通路となるタービン入口通路と給気通路となる圧縮機出口通路との間に、ＥＧＲバルブを備えたＥＧＲ通路を接続して排気ガス再循環できるようにしてあるディーゼルエンジンにおいて、上記タ

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ービン入口通路におけるＥＧＲ通路の接続部よりも上流側位置にＤＰＦを設置してなる構成としてあるので、ディーゼルエンジンの運転時間の増加に伴い、ＤＰＦに煤が蓄積して、該ＤＰＦ１６における圧力損失が変化した場合でも、ＤＰＦよりも下流側となるＥＧＲ通路の接続部におけるタービン入口通路内の排気ガスの圧力変化を抑制することができて、該ＥＧＲ通路を接続した給気側と排気側の圧力バランスの変化を抑えることができ、これにより、ＤＰＦへの煤の蓄積状況が変化してもＥＧＲバルブの開度調整を行うことなくＥＧＲ率をほぼ一定に保つことができて、ディーゼルエンジンの運転時に要する作業量を減らして制御性を向上させることができ、又、ＤＰＦに圧力の高い排気ガスを通すことができてＤＰＦの小型化が図れ、更に、ＤＰＦに高温の排気ガスを通して該ＤＰＦ自体の温度を高温とすることができることから、ＤＰＦの再生作業を容易なものとすることができる、という優れた効果を発揮する。

【図面の簡単な説明】

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【図１】本発明のディーゼルエンジンの実施の一形態を示す概要図である。

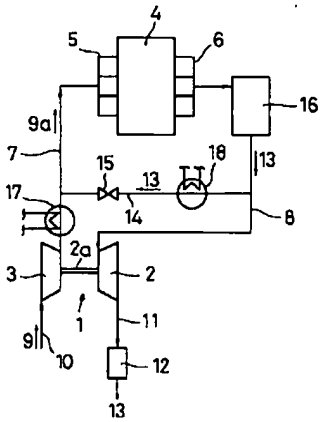
【図２】従来のディーゼルエンジンの一例を示す概要図である。

【図３】ＤＰＦへの煤の蓄積に伴うＥＧＲ率変化の問題を解消するために、従来提案されているディーゼルエンジンを示す概要図である。

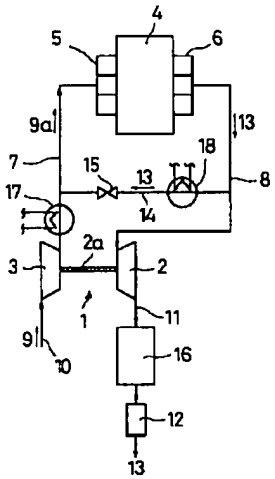
【符号の説明】

１　過給機
２　タービン
３　圧縮機
５　インテークマニホールド
６　エキゾーストマニホールド
７　圧縮機出口通路（給気通路）
８　タービン入口通路（排気ガス通路）
１４　ＥＧＲ通路
１５　ＥＧＲバルブ
１６　ＤＰＦ

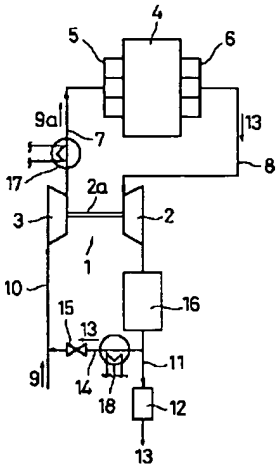
【図１】



【図２】



【図３】



フロントページの続き

(51)Int.Cl.[7]	識別記号	ＦＩ	ﾃｰﾏｺｰﾄﾞ(参考)
Ｆ０２Ｍ　25/07	５８０	Ｆ０２Ｍ　25/07	５８０Ｄ

Ｆターム(参考)　3G005 DA02 EA04 EA16 FA35 GB05
GB24 HA12 HA18
3G062 AA01 AA05 EA04 ED01 ED04
ED08 ED09 ED10
3G090 AA01 EA05 EA06

PAT-NO: JP02002174110A

DOCUMENT-IDENTIFIER: JP 2002174110 A

TITLE: DIESEL ENGINE

PUBN-DATE: June 21, 2002

INVENTOR-INFORMATION:

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APPL-NO: JP2000369181

APPL-DATE: December 4, 2000

INT-CL (IPC): F01N003/02, F02B037/00 , F02M025/07

ABSTRACT:

PROBLEM TO BE SOLVED: To suppress a change in EGR rate even when soot is
accumulated at a DPF.

SOLUTION: A supercharger 1 consisting of a turbine 2 and a compressor 3 is
connected to an intake manifold 5 of a diesel engine 4 and an exhaust manifold
6 via a compressor outlet passage 7 and a turbine inlet passage 8. An EGR
passage 14 having an EGR valve 15 is located between the turbine inlet passage
8 and the compressor outlet passage 7. The DPF 16 is situated at an upper
stream side of a connection part of the EGR 14 in the turbine inlet passage 8.
Exhaust gas 13 from the diesel engine 4 is fed to the DPF 16 to collect and
removed soot. The exhaust gas 13 from which soot is collected and removed by
the DPF 16 is fed to the turbine 2, and a supercharging pressure by the
supercharger 1 is generated. A part thereof is mixed in compressed air 9a
passing through the compressor outlet passage 7 through the EGR passage 14 and
circulated and fed to the diesel engine 4.

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] While having the supercharger which consists of a compressor and a turbine and compressing and carrying out the air supply of the inhalation of air with the compressor of this supercharger Between the compressor outlet paths used as the turbine inlet-port path which leads exhaust gas to the turbine of a supercharger, and is made to drive this turbine, and turns into a flueway, and an air-supply path The diesel power plant characterized by having the configuration which comes to install DPF in an upstream location rather than the connection of the EGR path in the above-mentioned turbine inlet-port path in the diesel power plant which connects the EGR path equipped with the EGR valve, and can be made to carry out exhaust gas recycle.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention installs a diesel particulate filter (DPF) in the passage of exhaust gas, and relates to the diesel power plant to which it is made not to change the rate of exhaust gas recycling in the diesel power plant which carries out uptake of the soot in exhaust gas, and enables it to have controlled emission into atmospheric air.
[0002]
[Description of the Prior Art] Generally, the large-sized diesel power plant used for a bus, a truck, etc. is equipped with the supercharger (turbocharger). The diesel power plant which equipped this seed supercharger As the outline of the example is shown in drawing 2 , the supercharger 1 which connects a turbine 2 and a compressor 3 by turbine-shaft 2a, and becomes To the intake manifold 5 and exhaust manifold 6 of a diesel power plant 4 It connects through the turbine inlet-port path 8 used as the compressor outlet path 7 and exhaust gas path which turn into an air-supply path, respectively. and as a configuration which connected the turbine outlet path 11 which connected to the entrance side of a compressor 3 the compressor inlet-port path 10 equipped with the air cleaner which is not illustrated, and equipped it with the silencer 12 at the outlet side of a turbine 2 It lets the turbine inlet-port path 8 pass for the exhaust gas 13 from a diesel power plant 4. To a turbine 2 Delivery, A compressor 3 is operated by the drive of the turbine 2 by this exhaust gas 13, air 9 is inhaled and (inhalation of air) compressed from the compressor inlet-port path 10, and it has been made to carry out the air supply of the compressed-air 9a to the diesel power plant 4 through the compressor outlet path 7. In addition, it is made to make the exhaust gas 13 worked and discharged in the turbine 2 have emitted into atmospheric air through the silencer 12 through the turbine outlet path 11.
[0003] By the above-mentioned diesel power plant, the cure against low NOX-ized in exhaust gas has been an important technical problem. therefore -- as the configuration which formed the EGR (exhaust gas recycling) path 14 between the above-mentioned turbine inlet-port path 8 and the compressor outlet path 7, and equipped this EGR path 14 with EGR valve 15 -- the opening of above-mentioned EGR valve 15 -- for example A part of exhaust gas 13 which passes along the turbine inlet-port path 8 by considering as 10% of opening It is based on the differential pressure by the side of air supply. From the EGR path 14 to the compressor outlet path 7 Delivery, it mixes in compressed-air 9a passing through this compressor outlet path 7 -- making -- a diesel power plant 4 -- circulation supply -- it can do -- making -- thereby -- combustion -- gaseous mixture -- the rate of inner inert gas is made to increase, while reducing an oxygen density, combustion temperature is lowered, and it enables it to have suppressed generating of NOX
[0004] On the other hand, in the case of the diesel power plant, the particulate matter contained in exhaust gas is set as the object of environmental standards. Therefore, in recent years, to control emission into the atmospheric air of the soot contained as part of control of exhaust gas in the exhaust gas discharged from a diesel power plant is desired increasingly. For this reason, it enables it to have controlled that soot is emitted into atmospheric air in the middle of the turbine outlet path 11 connected to turbine 2 outlet side of the above-mentioned supercharger 1 in the former by installing a diesel particulate filter (it being hereafter described as DPF) 16, letting it pass to DPF16, before emitting the exhaust gas 13 discharged from the turbine 2 into atmospheric air, and carrying out uptake of the soot

contained in exhaust gas 13.
[0005] In addition, in order that the intercooler prepared if needed in order that 17 may cool compressed-air 9a, and 18 may cool the exhaust gas 13 which carries out recycling, the EGR cooler prepared if needed is shown, respectively.
[0006]
[Problem(s) to be Solved by the Invention] However, in operation of a diesel power plant 4, although soot comes to be accumulated in DPF16 with the increment in operation time under the present circumstances, by the above-mentioned conventional diesel power plant Since the output pressure of a turbine 2 changes when the pressure loss in DPF16 changes with are recording of soot, since DPF16 is formed in the downstream of a turbine 2, Pressure balancing in the connection of the EGR path 14 linked to the compressor outlet path 7 and the connection of the EGR path 14 linked to the turbine inlet-port path 8 changes. For this reason, even if it holds the opening of EGR valve 15 uniformly by 10% of opening, in order for the amount of recycling of the exhaust gas 13 determined by pressure balancing of an exhaust side an air-supply side, i.e., an EGR rate, to change gradually, combustion, in order for the presentation of gaseous mixture to change, and for there to be a problem that the operation control of a diesel power plant 4 becomes difficult and to keep an EGR rate constant The problem that EGR valve 15 is operated each time and opening must be readjusted according to change of the are recording situation of the soot of DPF16 arises.
[0007] Incidentally, as a means to solve the above-mentioned problem, as shown in drawing 3 , rather than DPF16 between the turbine outlet side path 11 in a downstream location, and the compressor inlet-port path 10 By making it mix in the air 9 which forms the EGR path 14 equipped with EGR valve 15, introduces a part of low-pressure exhaust gas 13 into the compressor inlet-port path 10 by the EGR path 14, and passes along this compressor inlet-port path 10 Although it is proposed by the diesel power plant 4 that it is made to carry out circulation supply In this case, there is a possibility that a compressor 13 may corrode with the corrosive gas contained in this exhaust gas 13 since exhaust gas 13 will pass in a compressor 3. In order for actually adopting to carry out recycling of the low-pressure exhaust gas 13 difficult, there is also a problem that the path of the EGR path 14 must be enlarged.
[0008] Then, soot tends to accumulate this invention in DPF at the time of operation of a diesel power plant, also when the are recording situation changes, an EGR rate can be kept almost constant, and it is going to offer the diesel power plant which can raise a controllability.
[0009]
[Means for Solving the Problem] In order that this invention may solve the above-mentioned technical problem, while having the supercharger which consists of a compressor and a turbine and compressing and carrying out the air supply of the inhalation of air with the compressor of this supercharger Between the compressor outlet paths used as the turbine inlet-port path which leads exhaust gas to the turbine of a supercharger, and is made to drive this turbine, and turns into a flueway, and an air-supply path In the diesel power plant which connects the EGR path equipped with the EGR valve, and can be made to carry out exhaust gas recycle, it considers as the configuration which comes to install DPF in an upstream location rather than the connection of the EGR path in the above-mentioned turbine inlet-port path.
[0010] in the time of usual operation of a diesel power plant, exhaust gas is led to DPF through a turbine inlet-port path -- having -- this DPF -- soot -- uptake -- it is removed. the combustion in a diesel power plant since an EGR path is sent to a through compressor outlet path and a part of exhaust gas is mixed in air supply at the same time, as for uptake and the removed exhaust gas, soot is sent to a turbine -- gaseous mixture -- the rate of inner inert gas increases and, thereby, generating of NOX is controlled.
[0011] If soot is accumulated in DPF with the increment in the operation time of a diesel power plant, the pressure loss in this DPF will change, but since the effect of pressure loss becomes small in the outlet side of DPF in this case, change of pressure balancing of the air-supply side in the connecting location of an EGR path and an exhaust side is controlled, and an EGR rate is kept almost constant, without performing opening adjustment of an EGR valve.
[0012]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.
[0013] Drawing 1 like what shows one gestalt of operation of the diesel power plant of this invention,

and was shown in drawing 2 The supercharger 1 connects a turbine 2 and a compressor 3 by turbine-shaft 2a, and it is made to have driven the compressor 3 in the turbine 2 To the intake manifold 5 and exhaust manifold 6 of a diesel power plant 4 It connects through the turbine inlet-port path 8 as the compressor outlet path 7 and exhaust gas path as an air-supply path, respectively. And between the above-mentioned turbine inlet-port path 8 and the compressor outlet path 7 In the configuration which connected the EGR path 14 equipped with EGR valve 15, it considers as the configuration which comes to install DPF16 in an upstream location rather than the connection of the EGR path 14 in the above-mentioned turbine inlet-port path 8. In addition, the same sign is given to the same thing as what was shown in drawing 2 .

[0014] If the opening of EGR valve 15 is set up with 10% of opening and it operates, the exhaust gas 13 from a diesel power plant 4 will be sent to DPF16 through the turbine inlet-port path 8, and uptake of soot will be performed. Then, the exhaust gas 13 which uptake of the soot was carried out by the above DPF 16, and was removed is sent to a turbine 2, a part of exhaust gas 13 is sent to the compressor outlet path 7 through the EGR path 14 based on the differential pressure by the side of an exhaust side and air supply on the other hand, it is mixed in compressed-air 9as air supply a, and circulation supply is carried out at a diesel power plant 4. recycling of this exhaust gas 13 -- combustion -- gaseous mixture -- the rate of inner inert gas can be made to increase and generating of NOX comes to be controlled. After the exhaust gas 13 sent to the above-mentioned turbine 2 works in a turbine 2, it is emitted into atmospheric air through a silencer 12 through the turbine outlet path 11.

[0015] If soot is accumulated in DPF16 with the increment in the operation time of a diesel power plant 4, although the pressure loss in this DPF16 changes, in the outlet side of DPF16, the effect of the above-mentioned pressure loss will become small in this case. For this reason, the pressure variation of the exhaust gas 13 in the turbine inlet-port path 8 in the connection of the EGR path 14 which serves as the downstream from DPF16 can be controlled, and change of pressure balancing of an exhaust side can be suppressed an air-supply side. An EGR rate can be kept almost constant, without performing opening adjustment of EGR valve 15 by this, even if the are recording situation of the soot to DPF16 changes, the rating required at the time of operation of a diesel power plant can be reduced, and a controllability can be raised.

[0016] Moreover, since it can let the exhaust gas 13 with a high pressure pass to DPF16, and becomes possible to attain the miniaturization of this DPF, it has let the exhaust gas 13 with still few temperature falls pass to DPF16 and DPF16 the very thing serves as an elevated temperature, playback of DPF16 which is made to carry out elevated-temperature combustion and removes the accumulated soot can be made easy.

[0017] In addition, as for this invention, it is needless to say that modification can be variously added within limits which are not limited only to the gestalt of the above-mentioned implementation and do not deviate from the summary of this invention.

[0018]

[Effect of the Invention] As stated above, while according to the diesel power plant with DPF of this invention having the supercharger which consists of a compressor and a turbine and compressing and carrying out the air supply of the inhalation of air with the compressor of this supercharger Between the compressor outlet paths used as the turbine inlet-port path which leads exhaust gas to the turbine of a supercharger, and is made to drive this turbine, and turns into a flueway, and an air-supply path In the diesel power plant which connects the EGR path equipped with the EGR valve, and can be made to carry out exhaust gas recycle Since it has considered as the configuration which comes to install DPF in an upstream location rather than the connection of the EGR path in the above-mentioned turbine inlet-port path Soot is accumulated in DPF with the increment in the operation time of a diesel power plant. Even when the pressure loss in this DPF16 changes, the pressure variation of the exhaust gas in the turbine inlet-port path in the connection of the EGR path which serves as the downstream from DPF can be controlled. Change of pressure balancing of an exhaust side can be suppressed the air-supply side which connected this EGR path. By this An EGR rate can be kept almost constant, without performing opening adjustment of an EGR valve, even if the are recording situation of the soot to DPF changes. The rating required at the time of operation of a diesel power plant can be reduced, and a controllability can be raised. Moreover, it can let exhaust gas with a high pressure pass to DPF, and the miniaturization of DPF can be attained, and further, since temperature of this DPF itself can be made into an elevated

temperature through hot exhaust gas at DPF, the outstanding effectiveness that playback of DPF can be made easy is demonstrated.

[Translation done.]

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-174110

(43)Date of publication of application : 21.06.2002

(51)Int.Cl. F01N 3/02
F02B 37/00
F02M 25/07

(21)Application number : 2000-369181

(22)Date of filing : 04.12.2000

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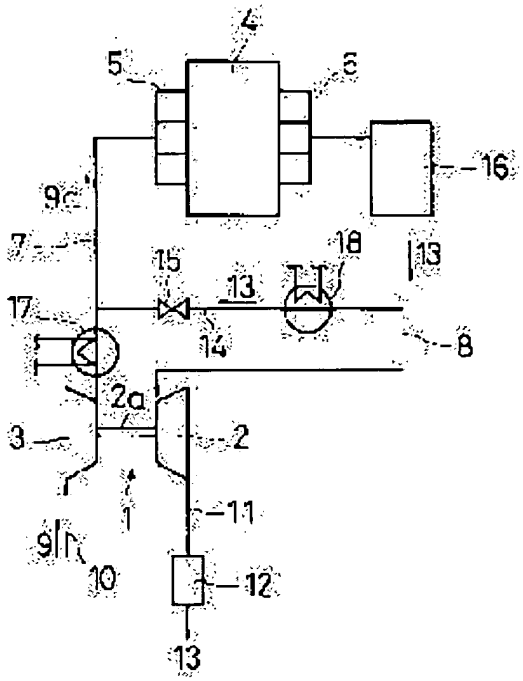
(72)Inventor : IKETANI NOBUYUKI
IRIE MAMORU

(54) DIESEL ENGINE

(57)Abstract:

PROBLEM TO BE SOLVED: To suppress a change in EGR rate even when soot is accumulated at a DPF.

SOLUTION: A supercharger 1 consisting of a turbine 2 and a compressor 3 is connected to an intake manifold 5 of a diesel engine 4 and an exhaust manifold 6 via a compressor outlet passage 7 and a turbine inlet passage 8. An EGR passage 14 having an EGR valve 15 is located between the turbine inlet passage 8 and the compressor outlet passage 7. The DPF 16 is situated at an upper stream side of a connection part of the EGR 14 in the turbine inlet passage 8. Exhaust gas 13 from the diesel engine 4 is fed to the DPF 16 to collect and removed soot. The exhaust gas 13 from which soot is collected and removed by the DPF 16 is fed to the turbine 2, and a supercharging pressure by the supercharger 1 is generated. A part thereof is mixed in compressed air 9a passing through the compressor outlet passage 7 through the EGR passage 14 and circulated and fed to the diesel engine 4.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]
[Claim 1] While having the supercharger which consists of a compressor and a turbine and compressing and carrying out the air supply of the inhalation of air with the compressor of this supercharger Between the compressor outlet paths used as the turbine inlet-port path which leads exhaust gas to the turbine of a supercharger, and is made to drive this turbine, and turns into a flueway, and an air-supply path The diesel power plant characterized by having the configuration which comes to install DPF in an upstream location rather than the connection of the EGR path in the above-mentioned turbine inlet-port path in the diesel power plant which connects the EGR path equipped with the EGR valve, and can be made to carry out exhaust gas recycle.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention installs a diesel particulate filter (DPF) in the passage of exhaust gas, and relates to the diesel power plant to which it is made not to change the rate of exhaust gas recycling in the diesel power plant which carries out uptake of the soot in exhaust gas, and enables it to have controlled emission into atmospheric air.
[0002]
[Description of the Prior Art] Generally, the large-sized diesel power plant used for a bus, a truck, etc. is equipped with the supercharger (turbocharger). The diesel power plant which equipped this seed supercharger As the outline of the example is shown in drawing 2 , the supercharger 1 which connects a turbine 2 and a compressor 3 by turbine-shaft 2a, and becomes To the intake manifold 5 and exhaust manifold 6 of a diesel power plant 4 It connects through the turbine inlet-port path 8 used as the compressor outlet path 7 and exhaust gas path which turn into an air-supply path, respectively. and as a configuration which connected the turbine outlet path 11 which connected to the entrance side of a compressor 3 the compressor inlet-port path 10 equipped with the air cleaner which is not illustrated, and equipped it with the silencer 12 at the outlet side of a turbine 2 It lets the turbine inlet-port path 8 pass for the exhaust gas 13 from a diesel power plant 4. To a turbine 2 Delivery, A compressor 3 is operated by the drive of the turbine 2 by this exhaust gas 13, air 9 is inhaled and (inhalation of air) compressed from the compressor inlet-port path 10, and it has been made to carry out the air supply of the compressed-air 9a to the diesel power plant 4 through the compressor outlet path 7. In addition, it is made to make the exhaust gas 13 worked and discharged in the turbine 2 have emitted into atmospheric air through the silencer 12 through the turbine outlet path 11.
[0003] By the above-mentioned diesel power plant, the cure against low NOX-ized in exhaust gas has been an important technical problem. therefore -- as the configuration which formed the EGR (exhaust gas recycling) path 14 between the above-mentioned turbine inlet-port path 8 and the compressor outlet path 7, and equipped this EGR path 14 with EGR valve 15 -- the opening of above-mentioned EGR valve 15 -- for example A part of exhaust gas 13 which passes along the turbine inlet-port path 8 by considering as 10% of opening It is based on the differential pressure by the side of air supply. From the EGR path 14 to the compressor outlet path 7 Delivery, it mixes in compressed-air 9a passing through this compressor outlet path 7 -- making -- a diesel power plant 4 -- circulation supply -- it can do -- making -- thereby -- combustion -- gaseous mixture -- the rate of inner inert gas is made to increase, while reducing an oxygen density, combustion temperature is lowered, and it enables it to have suppressed generating of NOX
[0004] On the other hand, in the case of the diesel power plant, the particulate matter contained in exhaust gas is set as the object of environmental standards. Therefore, in recent years, to control emission into the atmospheric air of the soot contained as part of control of exhaust gas in the exhaust gas discharged from a diesel power plant is desired increasingly. For this reason, it enables it to have controlled that soot is emitted into atmospheric air in the middle of the turbine outlet path 11 connected to turbine 2 outlet side of the above-mentioned supercharger 1 in the former by installing a diesel particulate filter (it being hereafter described as DPF) 16, letting it pass to DPF16, before emitting the exhaust gas 13 discharged from the turbine 2 into atmospheric air, and carrying out uptake of the soot

contained in exhaust gas 13.
[0005] In addition, in order that the intercooler prepared if needed in order that 17 may cool compressed-air 9a, and 18 may cool the exhaust gas 13 which carries out recycling, the EGR cooler prepared if needed is shown, respectively.
[0006]
[Problem(s) to be Solved by the Invention] However, in operation of a diesel power plant 4, although soot comes to be accumulated in DPF16 with the increment in operation time under the present circumstances, by the above-mentioned conventional diesel power plant Since the output pressure of a turbine 2 changes when the pressure loss in DPF16 changes with are recording of soot, since DPF16 is formed in the downstream of a turbine 2, Pressure balancing in the connection of the EGR path 14 linked to the compressor outlet path 7 and the connection of the EGR path 14 linked to the turbine inlet-port path 8 changes. For this reason, even if it holds the opening of EGR valve 15 uniformly by 10% of opening, in order for the amount of recycling of the exhaust gas 13 determined by pressure balancing of an exhaust side an air-supply side, i.e., an EGR rate, to change gradually, combustion, in order for the presentation of gaseous mixture to change, and for there to be a problem that the operation control of a diesel power plant 4 becomes difficult and to keep an EGR rate constant The problem that EGR valve 15 is operated each time and opening must be readjusted according to change of the are recording situation of the soot of DPF16 arises.
[0007] Incidentally, as a means to solve the above-mentioned problem, as shown in drawing 3 , rather than DPF16 between the turbine outlet side path 11 in a downstream location, and the compressor inlet-port path 10 By making it mix in the air 9 which forms the EGR path 14 equipped with EGR valve 15, introduces a part of low-pressure exhaust gas 13 into the compressor inlet-port path 10 by the EGR path 14, and passes along this compressor inlet-port path 10 Although it is proposed by the diesel power plant 4 that it is made to carry out circulation supply In this case, there is a possibility that a compressor 13 may corrode with the corrosive gas contained in this exhaust gas 13 since exhaust gas 13 will pass in a compressor 3. In order for actually adopting to carry out recycling of the low-pressure exhaust gas 13 difficult, there is also a problem that the path of the EGR path 14 must be enlarged.
[0008] Then, soot tends to accumulate this invention in DPF at the time of operation of a diesel power plant, also when the are recording situation changes, an EGR rate can be kept almost constant, and it is going to offer the diesel power plant which can raise a controllability.
[0009]
[Means for Solving the Problem] In order that this invention may solve the above-mentioned technical problem, while having the supercharger which consists of a compressor and a turbine and compressing and carrying out the air supply of the inhalation of air with the compressor of this supercharger Between the compressor outlet paths used as the turbine inlet-port path which leads exhaust gas to the turbine of a supercharger, and is made to drive this turbine, and turns into a flueway, and an air-supply path In the diesel power plant which connects the EGR path equipped with the EGR valve, and can be made to carry out exhaust gas recycle, it considers as the configuration which comes to install DPF in an upstream location rather than the connection of the EGR path in the above-mentioned turbine inlet-port path.
[0010] in the time of usual operation of a diesel power plant, exhaust gas is led to DPF through a turbine inlet-port path -- having -- this DPF -- soot -- uptake -- it is removed. the combustion in a diesel power plant since an EGR path is sent to a through compressor outlet path and a part of exhaust gas is mixed in air supply at the same time, as for uptake and the removed exhaust gas, soot is sent to a turbine -- gaseous mixture -- the rate of inner inert gas increases and, thereby, generating of NOX is controlled.
[0011] If soot is accumulated in DPF with the increment in the operation time of a diesel power plant, the pressure loss in this DPF will change, but since the effect of pressure loss becomes small in the outlet side of DPF in this case, change of pressure balancing of the air-supply side in the connecting location of an EGR path and an exhaust side is controlled, and an EGR rate is kept almost constant, without performing opening adjustment of an EGR valve.
[0012]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.
[0013] Drawing 1 like what shows one gestalt of operation of the diesel power plant of this invention,

and was shown in drawing 2 The supercharger 1 connects a turbine 2 and a compressor 3 by turbine-shaft 2a, and it is made to have driven the compressor 3 in the turbine 2 To the intake manifold 5 and exhaust manifold 6 of a diesel power plant 4 It connects through the turbine inlet-port path 8 as the compressor outlet path 7 and exhaust gas path as an air-supply path, respectively. And between the above-mentioned turbine inlet-port path 8 and the compressor outlet path 7 In the configuration which connected the EGR path 14 equipped with EGR valve 15, it considers as the configuration which comes to install DPF16 in an upstream location rather than the connection of the EGR path 14 in the above-mentioned turbine inlet-port path 8. In addition, the same sign is given to the same thing as what was shown in drawing 2 .

[0014] If the opening of EGR valve 15 is set up with 10% of opening and it operates, the exhaust gas 13 from a diesel power plant 4 will be sent to DPF16 through the turbine inlet-port path 8, and uptake of soot will be performed. Then, the exhaust gas 13 which uptake of the soot was carried out by the above DPF 16, and was removed is sent to a turbine 2, a part of exhaust gas 13 is sent to the compressor outlet path 7 through the EGR path 14 based on the differential pressure by the side of an exhaust side and air supply on the other hand, it is mixed in compressed-air 9as air supply a, and circulation supply is carried out at a diesel power plant 4. recycling of this exhaust gas 13 -- combustion -- gaseous mixture -- the rate of inner inert gas can be made to increase and generating of NOX comes to be controlled. After the exhaust gas 13 sent to the above-mentioned turbine 2 works in a turbine 2, it is emitted into atmospheric air through a silencer 12 through the turbine outlet path 11.

[0015] If soot is accumulated in DPF16 with the increment in the operation time of a diesel power plant 4, although the pressure loss in this DPF16 changes, in the outlet side of DPF16, the effect of the above-mentioned pressure loss will become small in this case. For this reason, the pressure variation of the exhaust gas 13 in the turbine inlet-port path 8 in the connection of the EGR path 14 which serves as the downstream from DPF16 can be controlled, and change of pressure balancing of an exhaust side can be suppressed an air-supply side. An EGR rate can be kept almost constant, without performing opening adjustment of EGR valve 15 by this, even if the are recording situation of the soot to DPF16 changes, the rating required at the time of operation of a diesel power plant can be reduced, and a controllability can be raised.

[0016] Moreover, since it can let the exhaust gas 13 with a high pressure pass to DPF16, and becomes possible to attain the miniaturization of this DPF, it has let the exhaust gas 13 with still few temperature falls pass to DPF16 and DPF16 the very thing serves as an elevated temperature, playback of DPF16 which is made to carry out elevated-temperature combustion and removes the accumulated soot can be made easy.

[0017] In addition, as for this invention, it is needless to say that modification can be variously added within limits which are not limited only to the gestalt of the above-mentioned implementation and do not deviate from the summary of this invention.

[0018]

[Effect of the Invention] As stated above, while according to the diesel power plant with DPF of this invention having the supercharger which consists of a compressor and a turbine and compressing and carrying out the air supply of the inhalation of air with the compressor of this supercharger Between the compressor outlet paths used as the turbine inlet-port path which leads exhaust gas to the turbine of a supercharger, and is made to drive this turbine, and turns into a flueway, and an air-supply path In the diesel power plant which connects the EGR path equipped with the EGR valve, and can be made to carry out exhaust gas recycle Since it has considered as the configuration which comes to install DPF in an upstream location rather than the connection of the EGR path in the above-mentioned turbine inlet-port path Soot is accumulated in DPF with the increment in the operation time of a diesel power plant. Even when the pressure loss in this DPF16 changes, the pressure variation of the exhaust gas in the turbine inlet-port path in the connection of the EGR path which serves as the downstream from DPF can be controlled. Change of pressure balancing of an exhaust side can be suppressed the air-supply side which connected this EGR path. By this An EGR rate can be kept almost constant, without performing opening adjustment of an EGR valve, even if the are recording situation of the soot to DPF changes. The rating required at the time of operation of a diesel power plant can be reduced, and a controllability can be raised. Moreover, it can let exhaust gas with a high pressure pass to DPF, and the miniaturization of DPF can be attained, and further, since temperature of this DPF itself can be made into an elevated

temperature through hot exhaust gas at DPF, the outstanding effectiveness that playback of DPF can be made easy is demonstrated.

[Translation done.]